

TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

IMPROVED, REAL-TIME, IN-LINE DETECTION OF STRONTIUM-90 IN PROCESS WATER

Identification No.: RL-SS08

Date: September 2001

Program: Environmental Restoration

OPS Office/Site: Richland Operations Office/Hanford Site

Operable Unit(s): 100-NR-2

PBS No.: RL-RC01 (RL-ER08)

Waste Stream: Groundwater (Disposition Map Designation: ER-10 [technical risk score 5] and ER-18 [technical risk score 5])

TSD Title: N/A

Waste Management Unit (if applicable): N/A

Facility: N/A

Priority Rating:

This entry addresses the “Accelerated Cleanup: Paths to Closure (ACPC)” priority:

- ☐ 1. Critical to the success of the ACPC
- ☐ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
- ☒ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Improved, Real-Time, In-Line Detection of Strontium-90 in Process Water

Need/Opportunity Category: Technology Opportunity

Need Description: Monitoring strontium-90 by discrete sampling is costly and slow. In-line sampling with real-time monitoring of contaminant concentrations may support the construction of fully automated treatment systems that could reduce operating costs.

Schedule Requirements:

Earliest Date Required: 8/1/99

Latest Date Required: 9/30/09

Pump and treat operations are ongoing as an expedited action. An interim record of decision (ROD) was issued in 1999 selecting an interim remedy. The interim ROD includes a requirement to evaluate other technologies by FY04.

Problem Description: The 100-N Area is located along the horn of the Columbia River in the northern portion of the Hanford Site and includes one nuclear reactor previously used for plutonium production.

The primary sources of contamination in the 100-NR-2 operable unit are cribs. Groundwater in the 100 Area ultimately discharges to the Columbia River. The principal contaminant is strontium. Activity of strontium-90 (half-life 29.3 years) in groundwater is up to 6000 pCi/L.

At present, concentrations of strontium-90 are measured by discrete sampling and analysis in field laboratories. These methods require approximately 24 hours for turn around. In general, laboratory analytical work is highly accurate, but time delays and high cost are considered to be significant drawbacks. In-line monitoring would lower the analytical chemistry cost of the pump and treat projects and would support design changes to allow fully automated operation of the ion exchange treatment systems.

Benefit to the Project Baseline of Filling Need: An on-line instrument may reduce the overall operating costs of the pump-and-treat system.

Functional Performance Requirements: The new technology must measure contaminant concentrations as process water passes through pipes at the in fluent and/or effluent ends of treatment processes. Results must be real-time and output must be transmittable through standard computer connections. In-line strontium-90 detection must be sensitive to concentrations on the order of 5-50 pCi/L to support 90% removal rate requirements. The technology must also be cost effective compared to the current discrete sampling approach.

Work Breakdown

Structure (WBS) No.: 1.4.03.1.1.07.08.09.02

TIP No.: N/A

Relevant PBS Milestone: PBS-MC-029

Justification For Need:

Technical: In-line sampling with real-time monitoring of contaminant concentrations may support the construction of fully automated treatment systems that would not require the continued presence of human operators, thus potentially reducing operating costs. In addition, closer monitoring of contaminant concentrations in the process streams would allow operators to accurately identify contaminant breakthrough of lead columns in the treatment systems. This increased efficiency could ultimately reduce the amount of ion exchange resin used, saving money.

Regulatory: There is no regulatory requirement for this technology need.

Environmental Safety & Health: There are no environmental safety and health issues of concern with this technology need.

Potential Life-Cycle Cost Savings of Need (in \$000s) and Cost Savings Explanation:

The estimated life-cycle cost savings associated with filling this need is \$200K. This estimate is based on an assumed savings of \$20K/yr over 10 years.

Cultural/Stakeholder Concerns: There are serious stakeholder concerns that detection limits above the regulatory standard may not be protective of aquatic organisms.

Other: None.

Current Baseline Technology: Laboratory analysis.

Cost: Pump and treat sampling costs for strontium are less than \$50K per year.

Waste: None.

How Long It Will Take: Operations scheduled beyond FY00.

End-User: Richland Environmental Restoration Project

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